

Supplementary Information for

**Rapid deposition of two-dimensional antimonene films by
thermal evaporation**

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Supplementary Figure 1 Thermal evaporation of Sb on different substrates.

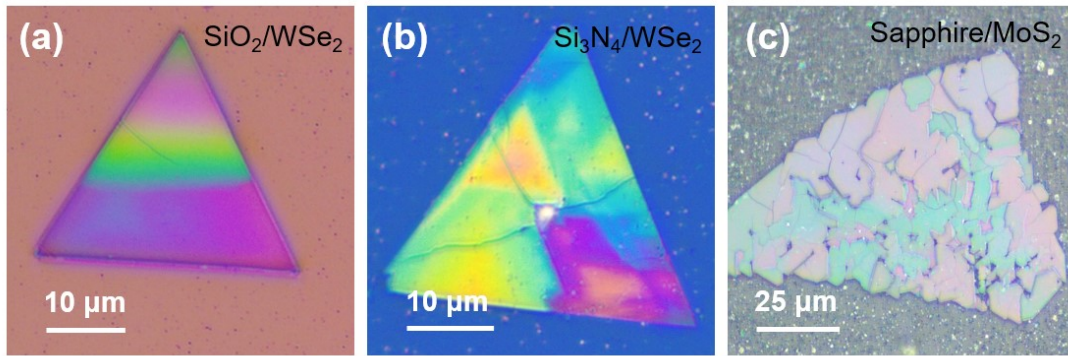
Supplementary Figure 2 Thickness of Sb thermally evaporated onto WS₂.

Supplementary Figure 3 Structural characterization of thin films formed by Sb deposition on WS₂ with increasing thermal evaporation time at 590°C heating temperature, height h = 5 cm.

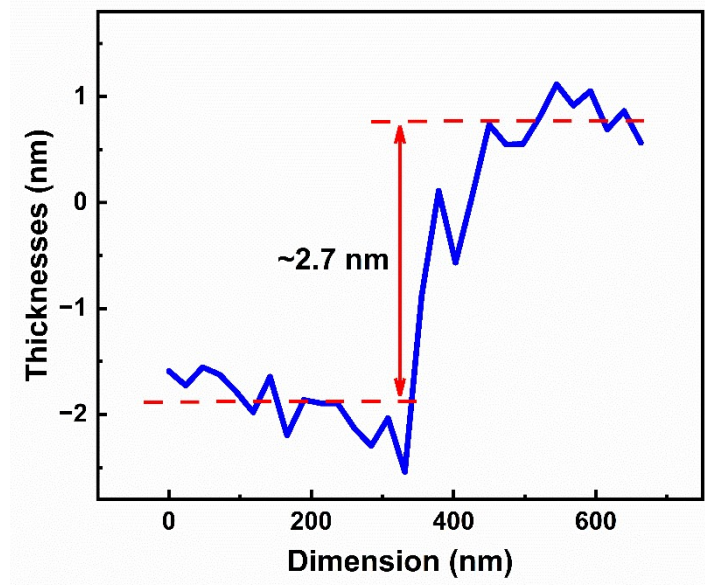
Supplementary Figure 4 Preparation of 2D antimonene on WS₂ by vapor deposition.

Supplementary Figure 5 Thermal evaporation of different materials on a single layer of WS₂.

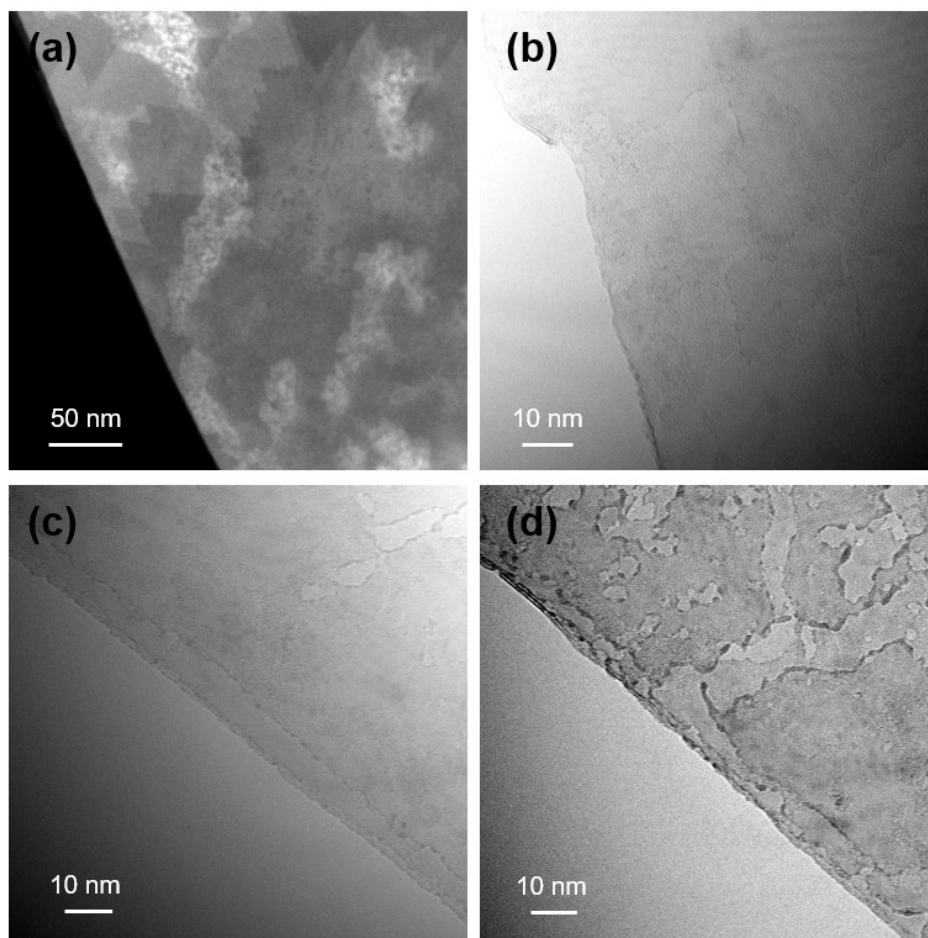
Supplementary Figure 6 Thermal evaporation of tellurium dioxide films on SiO₂.



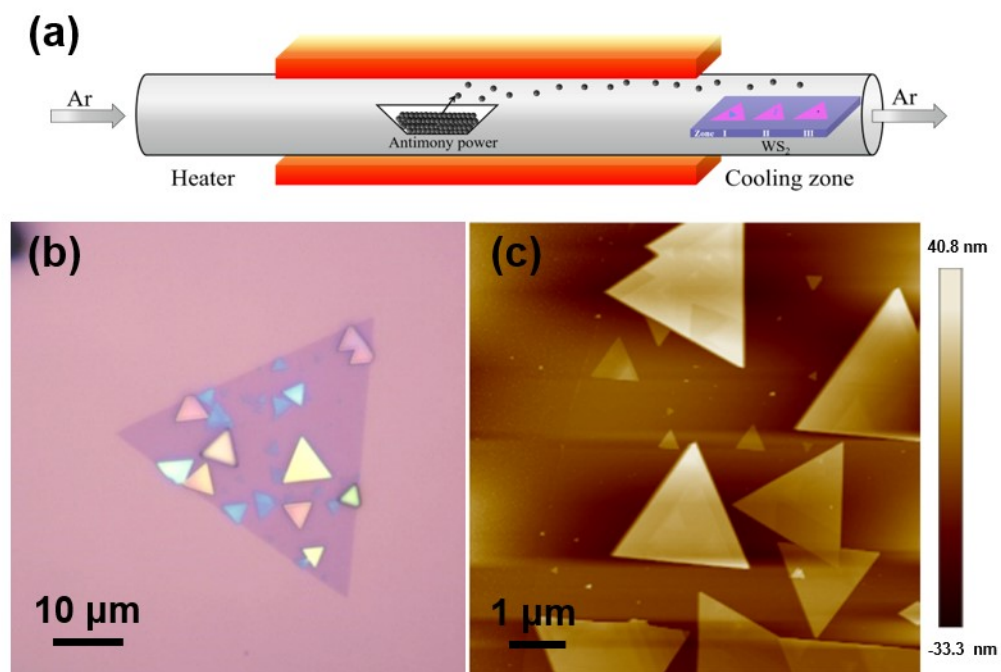
Supplementary Figure 1 Thermal evaporation of Sb on different substrates. Optical images of Sb thermal evaporation deposition on different substrates at a distance of 0 cm between the substrate and the porcelain boat, a heating temperature of 590 °C and a heating time of 120 s. (a) SiO₂/WSe₂, (b) Si₃N₄/WSe₂, (c) Sapphire/MoS₂.



Supplementary Figure 2 Thickness of Sb thermally evaporated onto WS₂. The heating temperature was 590°C and the heating height was 5 cm.

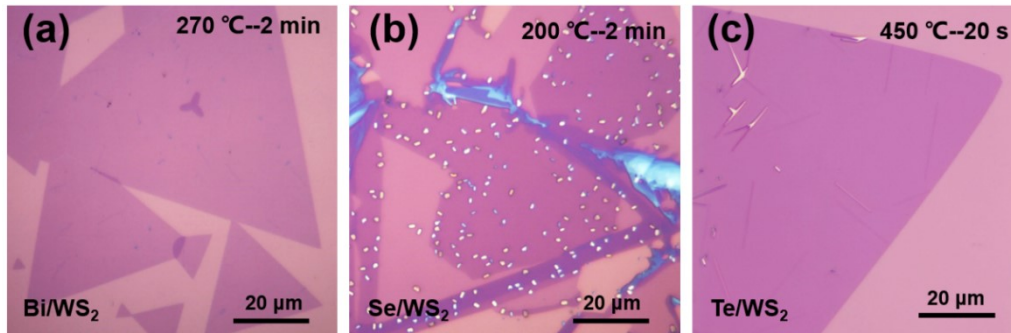


Supplementary Figure 3 Structural characterization of thin films formed by Sb deposition on WS₂ with increasing thermal evaporation time at 590°C heating temperature, height h = 5 cm. (a) Low-magnification TEM image at 10 s thermal evaporation time. (b) Low-magnification TEM image at 30 s thermal evaporation time. (c) Low-magnification TEM image at 60 s thermal evaporation time. (d) Low power TEM image of the sample after electron beam irradiation at 60 s thermal evaporation time.

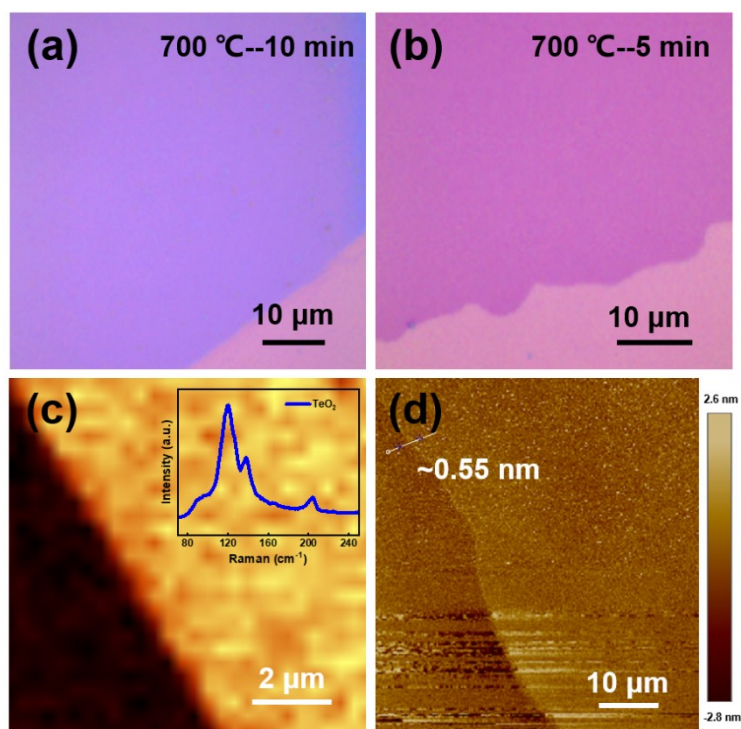


Supplementary Figure 4 Preparation of 2D antimonene on WS₂ by vapor deposition.

(a) Schematic of growth. (b) Optical image of antimonene grown on WS₂. (c) AFM image of antimonene grown on WS₂.



Supplementary Figure 5 Thermal evaporation of different materials on a single layer of WS₂. (a) thermal evaporation of Bi nanowires at 270 °C and 2 min heating condition; (b) thermal evaporation of Se nanosheets at 200 °C and 2 min heating condition; (c) thermal evaporation of Te nanowires at 450 °C and 20 s heating condition.



Supplementary Figure 6 Thermal evaporation of tellurium dioxide films on SiO₂. (a- b) Optical microscope maps of thin film deposition of TeO₂ at 700 °C with different thermal evaporation times: (a) 10 min; (b) 5 min. (c) Raman mapping of TeO₂, and the inset shows the Raman characteristic spectrum of TeO₂. (d) AFM of TeO₂ films obtained by thermal evaporation deposition.